

Nicolas Van Oostende
ASSOCIATE RESEARCH SCHOLAR

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Curriculum vitae

RESEARCH INTERESTS & AREAS OF EXPERTISE

My research addresses how microbial organisms shape the world we live in through their biochemical capacities, their interactions and life histories. Trained as a biologist, I have acquired expertise in the fields of marine microbial ecology and biogeography, bacteria-phytoplankton interactions, ocean biogeochemistry and the roles of phytoplankton in the nitrogen and carbon cycles (e.g., photosynthetic carbon fixation, nitrate uptake, calcification and extracellular production). I integrate mechanistic insights in these microbial interactions into biogeochemical models to test their impact on ocean elemental cycles.

SCIENTIFIC RESEARCH EXPERIENCE & APPOINTMENTS

- Associate research scholar - Ward Lab** 2015-present
Novel genome-based method to measure taxon-specific phytoplankton growth rates in natural communities (Co-PI, NSF grant)
Princeton University, Department of Geosciences & Cooperative Institute for Climate Science
Improving phytoplankton physiology in Earth System Models to simulate productivity in both subarctic spring blooms and oligotrophic subtropical gyres (Co-PI)
The impact of large phytoplankton on biogeochemical modeling of primary production and response to climate-induced ecosystem changes
- Post-doctoral research associate - Ward Lab** 2012-2015
Princeton University, Department of Geosciences and Geophysical Fluids Dynamic Laboratory, NOAA
Effects of climate change on phytoplankton community composition and carbon cycling; Biodiversity of phytoplankton related to N assimilation and new production
- Graduate IWT research fellow - Protistology and Aquatic Ecology Lab** 2007-2011
Ghent University, Belgium
Dissertation title: Dynamics of bacteria, phytoplankton and extracellular carbohydrates during blooms of the coccolithophore *Emiliana huxleyi*.
Integrated Marine Information System 304073

Graduate research associate - Protistology and Aquatic Ecology Lab <i>Ghent University, Belgium</i> Role of pelagic calcification and export of carbonate production in climate change.	2005-2007
Undergraduate senior thesis - Protistology and Aquatic Ecology Lab <i>Ghent University, Belgium</i> The diversity-productivity relationship in estuarine benthic diatoms: an experimental approach.	2004-2005
Undergraduate senior thesis - Zoophysiology Lab <i>Ghent University, Belgium</i> Monitoring of honey bee (<i>Apis mellifera</i> L.) foraging behavior using artificial flowers in a bee flight room.	2003-2004

EDUCATION

Ph.D. in Biology, Ghent University, Belgium Dissertation advisor: Prof. Koen Sabbe	2007-2011
M.Sc. in Marine and Lacustrine Sciences, Ghent University, Belgium Thesis advisor: Prof. Koen Sabbe	2004-2005
M.Sc. in Biology, Ghent University, Belgium Thesis advisor: Prof. Franciscus Jacobs	2002-2004
B.Sc. in Biology, Ghent University, Belgium	1998-2002

FELLOWSHIPS, HONORS & AWARDS

Co-PI on Early-concept Grant for Exploratory Research (EAGER) National Science Foundation: “Novel genome-based method to measure taxon-specific phytoplankton growth rates in natural communities”	2017
Co-PI on grant from the Cooperative Institute for Climate Science (NOAA-Princeton University) to assess “Improving phytoplankton physiology in Earth system models to simulate productivity in both subarctic spring blooms and oligotrophic subtropical gyres”	2017
Grant from the Cooperative Institute for Climate Science (NOAA-Princeton University) to assess “The impact of large phytoplankton on biogeochemical modeling of primary production and response to climate-induced ecosystem changes”	2015
Grant from the Ocean Carbon Biogeochemistry program for Summer Satellite Remote Sensing Training Course, Cornell University	2013
Doctoral grant from the Agency for Innovation by Science and Technology,	2008

Belgium

Doctoral **grant** from the Agency for Innovation by Science and Technology, 2006
Belgium

Pierre Verkerk **Award** for best M.S. dissertation in Biology, Ghent University, 2004
Belgium

PROFESSIONAL ACTIVITIES:

TEACHING EXPERIENCE, MENTORING & COMMUNITY INVOLVEMENT

Teaching and training experience:

Ocean, Atmosphere, and Climate GEO202, Princeton University, laboratory course design and preparation, spring 2016 and 2017

Biological Oceanography course GEO428, Princeton University, guest lecturer, February 2014 and April 2016.

Training of undergraduate students in laboratory and field techniques, Princeton University, 2014-present

Field and lab instructor Coastal Ecology course, Ghent University, April 2009, May 2010

Student mentoring:

Julia Carroll, Graduate student, Princeton University, September 2017 - present

Daniel Qian, Summer Internship, Princeton Environmental Institute, June-August 2016

Jana Suriano, Junior Project Princeton University, February-April 2016

Sunyoung Wang, Senior thesis Princeton University, September 2015-April 2016

Sunyoung Wang, Summer Internship, Princeton Environmental Institute, June-August 2015

Claire Zarakas, Junior Project Princeton University, February-April 2015

Martin Wolf, Junior Project Princeton University, February-April 2014

Sean McIntee, Junior Project Princeton University, February-April 2014

Naomi Breine, B.Sc. thesis, Ghent University, 2010

Frédérique Steen, B.Sc. thesis, Ghent University, 2009

Community involvement:

Session Chair at Ocean Sciences Meeting, “Integrating Observations of Plankton Communities and Physiology into Numerical Models”, Portland OR, 15 February 2018.

Coordinator of weekly Environmental Geology & Geochemistry Seminar lecture series, Princeton University, 2013-2015

Scientific presenter at European Researcher's Night public outreach event, Brussels, September 2010

Scientific presenter during open house event UGent at Sea, Ghent University, March 2009

External reviewer for: NSF Biological Oceanography, Croatian Science Foundation, Marine Environmental Research, Continental Shelf Research, Diatom Research, Estuarine, Coastal and Shelf Science, Hydrobiologia, Ocean Science, Journal of Geophysical Research, Marine Ecology Progress Series, Progress in Oceanography, Environmental Microbiology

Member of the American Geophysical Union and the Association for the Sciences of Limnology and Oceanography

SPECIFIC RESEARCH SKILLS

- ✓ Flow cytometric characterization and sorting of plankton communities
- ✓ Numerical ecosystem modeling (Python, MatLab)
- ✓ Stable isotope labelling pulse-chase experiments
- ✓ C/N elemental and isotope analysis (EA-IRMS)
- ✓ Molecular fingerprinting (DGGE, clone libraries, micro array) of microbial communities
- ✓ Chemotaxonomic characterization of algal communities (HPLC pigment separation)
- ✓ Remote sensing satellite data analysis
- ✓ Statistical data analyses using multivariate ordination
- ✓ Algal culturing, isolation techniques and cryopreservation
- ✓ Fatty acid extraction and analysis
- ✓ Tangential flow ultrafiltration for polysaccharide concentration
- ✓ Monosaccharide specific analysis (LC-IRMS),
- ✓ Microscopy techniques (light, epifluorescence and scanning electron microscopy)

BIBLIOGRAPHY

Forthcoming publications:

Fawcett, S. E., Johnson, K. S., Riser, S. C., **Van Oostende, N.**, Sigman, D. M., *in review*. Remineralization of low-nutrient organic matter in the Sargasso Sea thermocline and implications for the upper ocean carbon budget. *Global Biogeochemical Cycles*

Dussin, R., **Van Oostende, N.**, Curchitser, E. N., Stock, C. A., *in review*. Biogeochemical drivers of changing hypoxia in the California Current Ecosystem. *Geophysical Research Letters*

Sabadel, A.J.M., **Van Oostende, N.**, Ward, B. B., Woodward, E.M. S., Van Hale, R., Frew, R.D., *in review*. Characterization of particulate organic matter cycling during a summer North Atlantic phytoplankton bloom using compound-specific amino acid C and N stable isotopes. *Geochimica et Cosmochimica Acta*

Van Oostende, N., Fawcett, S. E., Marconi, D., Lueders-Dumont, J., Sigman D. M., and Ward, B. B., *in preparation*. Nitrogen assimilation by phytoplankton functional groups during a summer subarctic Atlantic bloom.

Van Oostende, N., Fawcett, S. E., Ji, Q., Lueders-Dumont, J., Sigman D. M., and Ward, B. B., *in preparation*. Seasonal variation in nitrogen assimilation partitioning between phytoplankton functional groups in the North Atlantic Ocean.

Peer-reviewed publications:

Van Oostende, N., Dussin, R., Stock, C. A., Barton, A. D., Curchitser, E., Dunne, J. P., and Ward, B. B., *accepted*. From the oligotrophic ocean gyres to coastal upwelling systems: Simulating the dynamic range of chlorophyll concentration. *Progress in Oceanography* DOI:

Peng, X., Fawcett, S. E., **Van Oostende, N.**, Wolf, M., Marconi, D., Sigman, D. M., and Ward, B. B., 2018. Nitrogen uptake and nitrification in the subarctic North Atlantic Ocean. *Limnology and Oceanography* DOI: 10.1002/lno.10784

Van Oostende, N., Fawcett, S. E., Marconi, D., Lueders-Dumont, J., Sabadel, A. J. M., Woodward, E. M. S., Jönsson, B. F., Sigman D. M., and Ward, B. B., 2017. Variation of summer phytoplankton community composition and its relationship to nitrate and ammonium assimilation across the North Atlantic Ocean. *Deep Sea Research Part I-Oceanographic Research Papers* DOI: 10.1016/j.dsr.2016.12.012

Ward, B. B. and **Van Oostende, N.**, 2016. Phytoplankton assemblage during the North Atlantic spring bloom assessed from functional gene analysis. *Journal of Plankton Research* 38 (5): 1135-1150. DOI: 10.1093/plankt/fbw043

Van Oostende, N., Dunne, J. P., Fawcett, S. E., Ward, B. B., 2015. Phytoplankton succession explains size-partitioning of new production in upwelling-induced blooms. *Journal of Marine Systems* 148: 14-25. DOI: 10.1016/j.jmarsys.2015.01.009

Van Oostende, N., Moerdijk-Poortvliet, T. C. W., Vyverman, W., Boschker, H. T. S., and Sabbe, K., 2012. Release of dissolved carbohydrates by *Emiliania huxleyi* and formation of transparent exopolymer particles depend on algal life cycle and bacterial activity. *Environmental Microbiology* 15 (5): 1514-1531. DOI: 10.1111/j.1462-2920.2012.02873.x

Van Oostende, N., Harlay, J., Vanelslander, B., Chou, L., Vyverman, W., and Sabbe, K., 2012. Phytoplankton community dynamics during late spring coccolithophore blooms at the continental margin of the Celtic Sea (North East Atlantic, 2006–2008). *Progress in Oceanography* 104: 1-16. DOI: 10.1016/j.pocean.2012.04.016

Harlay, J., Chou, L., De Bodt, C., **Van Oostende, N.**, Piontek, J., Suykens, K., Engel, A., Sabbe, K., Groom, S., Delille, B., and Borges, A. V., 2011. Biogeochemistry and carbon mass balance of a coccolithophore bloom in the northern Bay of Biscay (June 2006). *Deep Sea Research Part I-Oceanographic Research Papers* 58: 111-127. DOI: 10.1016/j.dsr.2010.11.005

De Bodt, C., **Van Oostende, N.**, Harlay, J., Sabbe, K., and Chou, L., 2010. Individual and interacting effects of pCO₂ and temperature on *Emiliania huxleyi* calcification: study of the calcite production, the coccolith morphology and the coccosphere size. *Biogeosciences* 7: 1401-1412. DOI: 10.5194/bg-7-1401-2010

Harlay, J., De Bodt, C., Engel, A., Jansen, S., d'Hoop, Q., Piontek, J., **Van Oostende, N.**, Groom, S., Sabbe, K., Chou, L., 2009. Abundance and size distribution of transparent exopolymer particles (TEP) in a coccolithophorid bloom in the northern Bay of Biscay. *Deep-Sea Research Part I-Oceanographic Research Papers* 56: 1251-1265. DOI: 10.1016/j.dsr.2009.01.014

Vanelslander, B., De Wever, A., **Van Oostende, N.**, Kaewnuratchadasorn, P., Vanormelingen, P., Hendrickx, F., Sabbe, K., Vyverman, W., 2009. Complementarity effects drive positive diversity effects on biomass production in experimental benthic diatom biofilms. *Journal of Ecology* 97: 1075-1082. DOI: 10.1111/j.1365-2745.2009.01535.x

PRESENTATIONS AT INTERNATIONAL CONFERENCES

(first author only)

“Seasonal distributional patterns of phytoplankton groups and biogeochemical features from subtropical to the subarctic Atlantic Ocean.” Ocean Sciences Meeting (poster), Portland OR, 13 February 2018.

“From oligotrophic gyres to coastal upwelling systems: simulating the dynamic range of chlorophyll concentration.” Ocean Carbon Biogeochemistry, summer workshop (poster), Woods Hole Oceanographic Institution MA, 26-29 June 2017

“Simulating the dynamic range of chlorophyll concentration from oligotrophic ocean gyres to coastal upwelling systems.” Association for the Sciences of Limnology and Oceanography Aquatic Sciences Meeting, Honolulu HI, 1 March 2017

“Functional diversity of marine eukaryotic phytoplankton and their contribution to the C and N cycling.” National Science Foundation, PI meeting Dimensions in biodiversity program (poster), Washington DC, 29 February- 1 March 2016

“Phytoplankton functional diversity and new production during spring and summer blooms in the subarctic Atlantic Ocean.” American Geophysical Union, Ocean Sciences Meeting, New Orleans LA, 21-26 February 2016

“Phytoplankton succession explains size partitioning of new production during upwelling blooms.” Ocean Carbon Biogeochemistry, "Trait-based Approaches to Ocean Life" workshop (poster), Waterville NH, 5-8 October 2015

“Distributional patterns of phytoplankton groups and biogeochemical features from the Caribbean to the Atlantic subarctic province in late summer.” American Society for Limnology and Oceanography Aquatic Sciences Meeting, Granada (Spain), 22-27 February 2015

“Phytoplankton succession and acclimation explains nitrate uptake following an upwelling event.” American Society for Limnology and Oceanography Aquatic Sciences Meeting, New Orleans LA, 17-22 February 2013

“Bacterial community structure and potential controlling factors along a water column stratification gradient during multi-annual coccolithophorid blooms.” VLIZ young scientists’ day, Brugge (Belgium), 25 February 2011

“Phytoplankton bloom progression shapes bacterial community composition along the continental margin of the Bay of Biscay.” International Society for Microbial Ecology 13, Seattle WA, 22-27 August 2010

“Inter-annual variation in the structure of bacterial communities associated with coccolithophorid blooms in the northern Bay of Biscay.” VLIZ young scientists’ day 10th anniversary edition, Oostende (Belgium), 27 November 2009

“Bacterial influence on the extracellular carbohydrate pool in experimental *Emiliana huxleyi* blooms.” VLIZ young scientists’ day, Brugge (Belgium), 6 March 2009

“How do bacteria influence the extracellular carbohydrate pool in experimental *Emiliana huxleyi* blooms?” American Society for Limnology and Oceanography Aquatic Sciences Meeting, Nice (France), 26-30 January 2009

“Coccolithophore bloom dynamics shape bacterioplankton community in the northern Bay of Biscay.” International Society for Microbial Ecology 12, Cairns (Australia), 17-22 August 2008

“Coccolithophore bloom dynamics shape bacterioplankton community in the northern Bay of Biscay.” VLIZ young scientists’ day, Brugge (Belgium), 29 February 2008

“Bacterial community structure during a coccolithophorid bloom in the northern Gulf of Biscay.” Necov minisymposium “Ecology of Aquatic Micro-organisms”, Amsterdam (The Netherlands), 7 December 2007

“Bacterial community structure during a coccolithophorid bloom in the northern Gulf of Biscay.” European Geosciences Union, General Assembly 2007, Vienna (Austria), 15-20 April 2007

“Bacterial community structure during a coccolithophorid bloom in the northern Gulf of Biscay.” VLIZ young scientists’ day, Brugge (Belgium), 2 February 2007

FIELD EXPERIENCE

R/V Endeavor, North Atlantic, May 2014

Measurement of phytoplankton community size structure and composition (chlorophyll *a*, flow cytometry, microscopy, DNA functional genes), nutrient uptake and nitrification rates through isotopic tracer incubations.

R/V Endeavor, North Atlantic, September 2013

Measurement of phytoplankton community size structure and composition (chlorophyll *a*, flow cytometry, microscopy, DNA functional genes), nutrient uptake and nitrification rates through isotopic tracer incubations.

R/V Atlantic Explorer, Sargasso Sea, August 2012

Measurement of phytoplankton community size structure and composition (chlorophyll *a*, flow cytometry, microscopy, DNA functional genes) and nutrient uptake rates through isotopic tracer incubations.

R/V Zeeleeuw, North Sea Channel, May 2010

Benthic fauna identification and sampling techniques, phytoplankton nutrient limitation experiments and diel phytoplankton chlorophyll *a* patterns.

R/V Zeeleeuw, North Sea Channel, April 2009

Benthic fauna identification and sampling techniques, phytoplankton nutrient limitation experiments and diel phytoplankton chlorophyll *a* patterns.

R/V Belgica, Celtic Sea, May 2007

Phytoplankton community composition and abundance (pigment HPLC, light and scanning electron microscopy), bacterial community composition, size structure and abundance (DNA DGGE fingerprinting, epifluorescence microscopy), mesozooplankton net tows, microzooplankton grazing experiments.

R/V Belgica, Celtic Sea, June 2006

Phytoplankton community composition and abundance (pigment HPLC, light and scanning electron microscopy), bacterial community composition, size structure and abundance (DNA DGGE fingerprinting, epifluorescence microscopy), mesozooplankton net tows.

R/V Belgica, northern North Sea, May 2006

Phytoplankton community composition and abundance (pigment HPLC, light and scanning electron microscopy), bacterial cell abundance (epifluorescence microscopy).